LEGIONELLOSIS

Also known as Legionnaires ' disease and Pontiac Fever

✓DISEASE AND EPIDEMIOLOGY

Clinical Description:

Legionellosis has two distinct forms: Legionnaires' disease, which is more severe, and Pontiac fever, which is milder. The most common initial symptoms of Legionnaires' disease and Pontiac fever are anorexia, myalgia, malaise, and headache. These symptoms are followed by fever (up to 102 - 105ºF), chills, and a non-productive cough. Other symptoms may include abdominal pain, mental confusion, and diarrhea.

Legionnaires ' disease:

Legionnaires' disease is a febrile illness primarily associated with pneumonia, which can be severe.

Pontiac Fever:

Pontiac fever is not usually associated with pneumonia or death, and cases usually recover in 2–5 days without treatment.

Causative Agent:

Legionellosis is an acute bacterial disease caused by *Legionella* species, with *Legionella pneumophila* being the most common. Numerous serogroups are implicated in human disease, although *L. pneumophila* serogroup 1 is most commonly associated with disease in humans.

Differential Diagnosis:

Legionnaires' disease usually cannot be distinguished from other forms of pneumonia and requires specific tests to confirm the diagnosis.

Laboratory identification:

There are many ways to identify legionella: culture, urinary antigen, DFA, PCR, and serology.

- Culture of tracheal aspirates or bronchoscopy specimens is the most specific method, and assists with outbreak investigations because isolates can be compared with environmental isolates to determine the source of the infection, but culture sensitivity may be lower than some other identification methods, depending upon the quality of the specimen and the expertise of the laboratory performing the culture. Sensitivity can range from 20-95%. Specimens from the lower respiratory track will provide greater sensitivity than sputum.
- PCR testing of respiratory secretions is sensitive and is not impacted by prior antibiotic treatment (unlike culture). The sensitivity and specificity of this test can vary widely depending upon the expertise of the laboratory performing the testing.
- Urinary antigen is a rapid test that is sensitive early in the infection, but as the infection progresses, sensitivity may drop. (Estimated sensitivity 65-95%) However, in some individuals the antigen can remain elevated for many months

after the infection, and thus may not represent the etiological agent for the current event. Also the urinary antigen only detects antigen produced by *Legionella pneumophila* serogroup 1. Thus disease due to other serogroups will not be detected.

- Serology is not helpful for acute diagnoses, it requires paired sera (acute and convalescent) for interpretation. Convalescent sera is best when collected 4-6 weeks after infection. Some serological assays only detect serogroup 1, others can detect additional serogroups. The sensitivity of serology ranges from 20-75%, making this an unacceptable diagnostic test.
- DFA is less sensitive (20-60%) and false positives occur, especially when using sputum as a sample, because the reagents can cross-react with other mouth flora.
  UPHL: The UPHL can provide confirmation of and serological grouping of isolates from clinical labs. The UPHL can also provide environmental testing of water samples. Arrangements for environmental tests must be made in advance.

Treatment:

Fluoroquinolones (levofloxacin, gatifloxacin, moxifloxin) and azithromycin are the preferred treatment regimens. Rifampin can be added to the above in cases of severe illness.

Case fatality:

Legionellosis: The overall case-fatality rate is 5–40%.
Pontiac Fever: This is rarely fatal.

Reservoir:

Legionella is commonly found in the environment. The bacteria are most likely to reproduce in high numbers in warm, stagnant water. In this environment, they live as intracellular parasites of free-living amoebae.

- Generally, legionella reservoirs are thought to be aqueous and can be found in a variety of habitats such as lakes, streams, or coastal oceans.
- It can also be found in man-made habitats such as cooling towers, spas or hot tubs, showers, fountains, respiratory therapy devices, grocery store misters, dental equipment that sprays water, etc.
- Legionella can grow at a wide range of temperatures, from 5° to 50°F, but warm water (25-40°F) will support the highest concentration of organisms.
- Legionella can be found in hot and cold tap water, even in ice machines.
- Since it can be found in the soil, it is possible that soil disturbances (such as excavation) may also lead to cases of disease.
- Legionella can be difficult to recover from the environment due to their ability to enter into a resting state where the organisms are viable, but are not cultivatable.
- Also, legionella readily forms a biofilm on surfaces, which can reduce the effectiveness of disinfection procedures.

Transmission:

Legionellosis is transmitted via the airborne route when aerosols are inhaled from a water source contaminated with the bacteria, or through aspiration. There is anecdotal evidence that drinking water or ice may also lead to disease. Legionellosis is not known to be transmitted from person to person.

Any water source that might be aerosolized should be considered a potential source for transmission of legionellae. The bacteria are rarely found in municipal water supplies and tend to colonize plumbing systems and point-of-use devices. To colonize, legionellae usually require a temperature range of 77°F-108°F (25°C--42.2°C) and are most commonly located in hot water systems. However, cold water systems and ice machines with filters have been documented to harbor legionellae and should not be overlooked as a possible source. Legionellae do not survive drying. Therefore, air-conditioning equipment condensate, which frequently evaporates, is not a likely source.

Susceptibility:

People at highest risk are over the age of 50 years, males, smokers or others with chronic respiratory diseases, diabetics, and people who are immunocompromised (such as corticosteroid use, cancer, transplants, etc.). Prior infection does not necessarily prevent re-infection.

Incubation period:

The incubation period for Legionnaires' disease ranges from 2–10 days, but is most commonly 5–6 days. The incubation period for Pontiac fever ranges from 5–66 hours, but is most commonly 24–48 hours.

Period of communicability:

Legionellosis is not transmitted from person to person.

Epidemiology:

Legionnaires' disease was named after an outbreak that occurred among people attending a convention of the American Legion in Philadelphia in 1976. Legionellosis has a worldwide distribution. An estimated 8,000–18,000 people develop Legionnaires' disease in the U.S. each year. Most of these are single, isolated cases that are not associated with an outbreak. *Legionella pneumophila* serogroup 1 is responsible for about 70% of the cases. Outbreaks usually occur in the summer and fall, though cases can occur year-round. Serologic surveys have shown a prevalence of antibodies to *L. pneumophila* serogroup 1 at a titer of ≥1:128 in 1–20% of the population. Illness most severely affects older persons, especially those who smoke cigarettes or have chronic lung disease. Other risk factors include immunosuppressive therapy and immunosuppressive diseases such as AIDS and diabetes. *Legionella* is estimated to be responsible for 0.5–5% of cases of community-acquired pneumonia. Nationwide, approximately 1100 cases of legionellosis are reported annually, for a rate of 0.4 cases/100,000 population annually. Prospective

studies show that the actual incidence of disease is closer to 8 cases/100,000 population annually.

✓PUBLIC HEALTH CONTROL MEASURES

Public health responsibility:

- Investigate all suspect cases of disease and fill out and submit appropriate disease investigation forms.
- Provide education to the general public, clinicians, and first responders regarding disease transmission and prevention.
- Identify clusters or outbreaks of this disease.
- Identify sources of exposure and stop further transmission.
- Identify whether case was nosocomial.
- Identify whether case was travel-associated.

Single case – not nosocomial:

- Collect travel information during the XX period prior to illness onset. Obtain information on hotels, campgrounds, etc. and dates.

Single case – nosocomial:

- Collect information on hospital or long term care facility, dates of inpatient/outpatient visits, floors, wards, and room numbers. Also collect information on respiratory therapy.

Multiple cases – not nosocomial:

- Three cases of legionella in a 30 day period are considered a cluster.
- Investigators should look closely at individual cases that do not meet the typical risk factors.

Multiple cases – nosocomial:

- Any hospital or long term care facility that has evidence of 2 nosocomial cases in a 6 month period.
- Meet with infection control practitioners and document steps that they are taking to resolve the issue.

Prevention:

The only prevention is to identify possible sources of transmission and eliminate them. This requires some educational efforts to areas like hospitals, long term care facilities, hotels, cruise ships, and owners of whirlpool spas and decorative fountains. Timely reporting so that outbreaks can be detected and investigated is essential.

Chemoprophylaxis:

High risk people who have had exposure or are in an epidemic can be given macrolide antibiotics prophylactically.

Vaccine:

There is no vaccine available.

Isolation and quarantine requirements:

Isolation: None
Hospital: None
Quarantine: None

✓CASE INVESTIGATION

Reporting:

Report the following cases:

- Isolation of legionella from any body site
- Identification of legionella from urine by antigen
- A convalescent IgM titer greater than an acute titer
- Detection of legionella antigen through DFA staining or immunohistochemistry
- Nucleic acid (e.g. PCR) identification of legionella

Case definition:

Legionellosis (2005):

Clinical Description

Legionellosis is associated with two clinically and epidemiologically distinct illnesses: Legionnaires' disease, which is characterized by fever, myalgia, cough, and clinical or radiographic pneumonia; and Pontiac fever, a milder illness without pneumonia.

Laboratory Criteria

Confirmed:

By culture: isolation of any *Legionella* organism from respiratory secretions, lung tissue, pleural fluid, or other normally sterile fluid.
By detection of *Legionella pneumophila* serogroup 1 antigen in urine using validated reagents.
By seroconversion: fourfold or greater rise in specific serum antibody titer to *Legionella pneumophila* serogroup 1 using validated reagents.

Suspect:

By seroconversion: fourfold or greater rise in antibody titer to specific species or serogroups of *Legionella* other than *L. pneumophila* serogroup 1 (e.g., *L. micdadei*, *L. pneumophila* serogroup 6).
By seroconversion: fourfold or greater rise in antibody titer to multiple species of *Legionella* using pooled antigen and validated reagents.
By the detection of specific *Legionella* antigen or staining of the organism in respiratory secretions, lung tissue, or pleural fluid by direct fluorescent antibody (DFA) staining, immunohistochemstry (IHC), or other similar method, using validated reagents.
By detection of *Legionella* species by a validated nucleic acid assay.

Case Classification

Suspect: a clinically compatible case that meets at least one of the presumptive (suspect) laboratory criteria.

Travel-associated: a case that has a history of spending at least one night away from home, either in the same country of residence or abroad, in the ten days before onset of illness.

Confirmed: a clinically compatible case that meets at least one of the confirmatory laboratory criteria.

Travel-associated: a case that has a history of spending at least one night away from home, either in the same country of residence or abroad, in the ten days before onset of illness.

Nosocomial:

Confirmed: A laboratory-confirmed case that occurs in a patient who has been hospitalized continuously for ≥ 10 days before the onset of illness.

Case Investigation Process:

- Fill out a morbidity form.
- Identify whether case is nosocomial or travel-associated.
- Fill out the investigation form.
- Within 7 days of notification of legionellosis case, the investigating health department will ascertain whether the case-patient spent at least one night away from home in the 10 days before onset of illness.
- If history of travel is present in the 10 days before onset of illness, the state health department will, within 7 days of the initial notification, report travel destination (city and state or country) and dates of travel to CDC and to the state of travel.
- If there is no history of travel in the 10 days before onset of illness, the state health department will complete the legionellosis case report and send to CDC within 30 days of notification.
- If there are epidemiologically linked travel-associated legionellosis cases, CDC will notify within one day and work with state health departments to investigate further.

Outbreaks:

An outbreak will be defined as:

- 2 or more cases of nosocomial legionella in a hospital or long term care facility in any 6 month period.
- 3 or more cases of legionella (not nosocomial) identified with onset dates within a 30 day period.

Additional investigation measures will be implemented during either of these situations.

Identification of case contacts:

Legionella is not transmissible from person-to-person.

- In the event of an outbreak with a known transmission source, then identifying individuals at high risk is reasonable. High risk patients are detailed in the "Susceptibility" section.

Case contact management:

Individuals at high risk of acquiring the disease can be prophylaxed with macrolide antibiotics.

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